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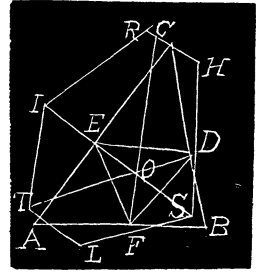
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Solution by G. B. M. ZERR, A. M., Ph. D., 4243 Girard Avenue, Philadelphia, Pa.

Let  $ABC$  be the triangle,  $DEF$  the stretched string,  $P$  the force exerted by the string,  $O$  the in-center of  $DEF$ . Then the resultant of the forces in  $DE$ ,  $DF$  is  $2P\cos\frac{1}{2}A$ , acting from  $D$  through  $O$ . Let  $OT$  represent this force. The resultant of the forces in  $FE$ ,  $FD$  is  $2P\cos\frac{1}{2}C$  acting from  $F$  through  $O$ . Let  $OR$  represent this force. The resultant of the forces in  $EF$ ,  $ED$  is  $2P\cos\frac{1}{2}B$  acting from  $E$  through  $O$ . Let  $OS$  represent this force.  $OT$  can be replaced by two parallel forces equal to  $\frac{1}{2}OT$  acting at  $B$  and  $C$ , respectively;  $OR$ , by two parallel forces equal to  $\frac{1}{2}OR$  acting at  $A$  and  $B$ , respectively; and  $OS$ , by two parallel forces equal to  $\frac{1}{2}OS$  acting at  $A$  and  $C$ , respectively. Completing the parallelograms, we get  $OH$  the resultant of  $OR$  and  $OS$ , and  $\frac{1}{2}OH$  represents the reaction at  $A$ .  $OI$  is the resultant of  $OR$  and  $OT$  while  $\frac{1}{2}OI$  represents the reaction at  $B$ .  $OL$  is the resultant of  $OT$  and  $OS$ , and  $\frac{1}{2}OL$  represents the reaction at  $C$ .



#### AVERAGE AND PROBABILITY.

194. Proposed by PROF. R. D. CARMICHAEL, Anniston, Ala.

What is the mean value of the triangle formed by joining three points taken at random on the circumference of a circle?

Solution by G. B. M. ZERR, A. M., Ph. D., 4243 Girard Avenue, Philadelphia, Pa.

Let  $OC$  = diameter of given circle =  $2a$ . Let the point  $P$  be fixed, draw  $PO$  perpendicular to  $OC$ , and draw  $OA$  and  $OB$ . Let  $\angle POA = \theta > \frac{1}{2}\pi$ ,  $\angle POB = \phi < \frac{1}{2}\pi$ .

$\therefore OA = 2a \sin \theta$ , and  $OB = 2a \sin \phi$ . Area  $OAB = 2a^2 \sin \theta \sin \phi \sin(\theta - \phi)$ .  
Average area =  $\Delta$ ,

$$\begin{aligned} &= \frac{\int_0^\pi \int_0^\theta 2a^2 \sin \theta \sin \phi \sin(\theta - \phi) d\theta d\phi}{\int_0^\pi \int_0^\theta d\theta d\phi} \\ &= \frac{4a^2}{\pi^2} \int_0^\pi \int_0^\theta \sin \theta \sin \phi \sin(\theta - \phi) d\theta d\phi = \frac{2a^2}{\pi^2} \int_0^\pi (\sin^2 \theta - \theta \sin \theta \cos \theta) d\theta \\ &= \frac{3a^2}{2\pi}. \end{aligned}$$